TECHNICAL NOTES

NATURAL RESOURCES CONSERVATION SERVICE – WYOMING

AGRONOMY NO. 19 **June 25, 2001**

SUBJECT: Nutrient Management and Comprehensive Nutrient Management Plan Components/Checklists

All Nutrient Management Plans must be reviewed and approved by a certified Nutrient Management Planner.

The Nutrient Management Plan is a single component of an overall conservation plan. All other Essential Practices and the associated supporting documentation/quality criteria should also be included in the case file.

Plans for the Nutrient Management component of a conservation plan will include the following items and jobsheets, as applicable:

NUTRIENT MANAGEMENT PLAN CHECKLIST

✔	COMPONENT
	Aerial site photographs or maps.
	Soil maps and relevant soil map unit interpretation information.
	Current and/or planned crop rotation. This information should be shown on the appropriate jobsheet *(ECS – 44, ECS – 45A or ECS – 45B).*
	Soil and manure test results. A soil test result no more than 5 years old is **required**. Copies of the actual soil test results should be retained in the case file. A manure test is not required but strongly encouraged (*ECS – 44, ECS – 45A or ECS – 45B).*
	Realistic yield goals and a brief description of how they were determined. *(ECS – 44, ECS – 45A or ECS – 45B).*
	Recommended nutrient application rates. *(Agronomy Tech Note #10 – University of Wyoming Guide to Fertilizer Recommendations, ECS – 44, ECS – 45A or ECS – 45B).*
	A complete nutrient budget for nitrogen, phosphorus, and potassium. *(ECS – 44, ECS – 45A or ECS – 45B).*
	Quantification of all important nutrient sources. This should include, but not be limited to commercial fertilizer, animal manure and other organic by-products and irrigation water contribution. *(ECS – 44, ECS – 45A or ECS – 45B).*
	Planned rates, methods, and timing (month and year) of nutrient application. *(ECS – 44, ECS – 45A or ECS – 45B).* If manure or other organic by-products are land-applied, the Phosphorus Index *(Agronomy Tech Note #15* must also be completed).
	Location of any sensitive areas or resources if present on the conservation management unit. Sensitive areas will be identified on the Conservation Plan Map. Sensitive areas can include ground and surface water, shallow aquifers, and runoff or run on areas. Any required mitigating practices (filter strips), should also be shown on the map.
	Guidance for implementation, operation, maintenance, and record keeping.

Because of the complexity and need for confidentiality, a CNMP should be developed in a separate case file from the rest of a producer's conservation plan and maintained solely by the producer. The following is guidance on the required components of a CNMP, how a CNMP case file might be assembled, and the supporting forms/jobsheets that should be completed.

Component

Feed Management – This is not a practice in the FOTG, therefore, NRCS is not ultimately responsible for this component of a CNMP and NRCS will not prescribe feed practices. However, as part of alternative development, planners may wish to discuss the effect that feed management has on nutrient production and utilization. Animal diets and feed may be modified to reduce the amounts of nutrients in manure. Reduced inputs and greater utilization of phosphorus by the animal reduces the amount of phosphorus excreted and produces a manure with a nitrogen:phosphorus ratio closer to that required by crop and forage plants. Information on livestock dietary requirements is available from the University of Wyoming Extension Service.

Manure Handling and Storage – Manure needs to be handled and stored properly to prevent water pollution from AFOs. Manure and wastewater handling storage practices should also consider odor and other environmental and public health concerns. Handling and storage considerations should include:

Divert Clean Water – Siting and management practices should divert clean water from contact with feed lots and holding pens, animal manure, or manure storage systems. Clean water can include rainfall falling on roofs of facilities, runoff from adjacent lands or other sources.

Prevent Leakage – Construction and maintenance of buildings, collection systems, conveyance systems, and permanent and temporary storage facilities should prevent leakage of organic matter, nutrients, and pathogens to ground or surface water.

Provide Adequate Storage – Liquid manure storage systems should safely store the quantity and contents of animal manure and wastewater produced, contaminated runoff from the facility, and rainfall. Dry manure, such as that produced in a typical Wyoming feedlot operation should be stored in such a way as to prevent polluted runoff. This can include drystacking in the feeding facility or other appropriate storage locations. Location of manure storage systems should consider proximity to water bodies, floodplains, and other environmentally sensitive areas.

Manure Treatments – Manure should be handled in such a way as to reduce the loss of nutrients to the atmosphere during storage and application.

Management of Dead Animals – Dead animals should be disposed of in a way that does not adversely affect ground or surface water or create public health concerns. Composting, rendering, and other practices are common methods used to dispose of dead animals. Regardless of disposal method, producers should be encouraged to incorporate this element into their Record Keeping system.

Land Application of Manure – Land application is the most common, and usually most desirable method of utilizing manure because of the value of the nutrients and organic matter. Land application should be planned to ensure that the proper amounts of all nutrients are applied in a way that does not cause harm to the environment or to public health. Land application should minimize water quality and public health risk. Appropriate land application should include:

Nutrient Balance – The primary purpose of nutrient management is to achieve the level of nutrients required to grow the planned crop by balancing the nutrients that are already in the soil and from other sources with those that will be applied in manure, biosolids, and commercial fertilizer. The guidance from the Nutrient Management portion of this Technical Note applies to this component of a CNMP.

Timing and Methods of Application – Care should be taken when land-applying manure to prevent if from entering streams, other water bodies, or environmentally sensitive areas. The timing and methods of application should minimize loss of nutrients to ground or surface water and the loss of nitrogen to the atmosphere. Manure application equipment should be calibrated to ensure that the quantity of material being applied is what is planned.

Land Management – Tillage, crop residue management, crop rotation and other conservation practices should be utilized to minimize movement to surface and ground water of soil, organic materials, nutrients, and pathogens from lands where manure is applied. Buffer practices should be installed on fields receiving applications of manure.

Record Keeping – Animal Feeding Operation operators should keep records that indicate the quantity of manure produced and how the manure was utilized, including where, when, and amounts applied. Records should also include the acreages/crop type/crop yields and soil and manure testing information. Records should also be kept when manure leaves the AFO to be utilized off-site.

Other Utilization Options – The sale of manure to other producers, composting and sale of compost to homeowners. If this is part of a CNMP, it should be part of the record keeping process.

COMPREHENSIVE NUTRIENT MANAGEMENT PLAN CHECKLIST

✔	Component	Recommended Location in Case File	Documentation/Jobsheet
	Feed Management	Cover #1	Narrative or copies of Land Grant University or National Research Council livestock nutrient need recommendations
	Manure Handling and Storage		
	Divert Clean Water	Engineering Calculations on Cover #6	Narrative or if structural practices required, design criteria should include:
			Diversion Dike and Channel
			Roof Runoff Management
	Prevent Leakage	Engineering Calculations on Cover #6	Narrative including discussion of leakage from all retention structures and leachate from silage storage areas.
			Soil Seepage/Permeability Investigations (Geologist's Report)
			Soil Seepage Calculations (Engineer/Geologist)
			Geo-technical Investigation (Technical Specialist)
			Soil Mechanics Test (Soil Mechanics Lab)
			Groundwater Analysis (Geologist's Report)
			Soil Permeability Estimates (Chapter 10D AWMFH)
			Seepage Analysis (Geologist's Report)
	Provide Adequate Storage	Engineering Calculations on Cover #6	Design criteria should include:
			Feedlot Drainage Area
			Normal Precipitation (NOAA)
			Normal Runoff from Feedlot (Chapter 10 AWMFH)
			25 Yr – 24 Hr. Precipitation (NOAA)
			25 Yr – 24 Hr. Runoff from Feedlot (EFM – 2)
			Evaporation from Storage Facility (NWS)
			Net Storage Required
			Compaction Requirements (Engineer/Geologist)
			Topographic Survey (Field Office)

COMPREHENSIVE NUTRIENT MANAGEMENT PLAN CHECKLIST (CONT'D)

✔	Component	Recommended Location in Case File	Documentation/Jobsheet
	Provide Adequate Storage (cont'd)	Engineering Calculations on Cover #6	Design criteria should include:
			Weighted Runoff Curve Number Calculations (EFM-2)
			Evaporation vs. Normal Precipitation Calculations
			Total Storage Requirement Calculation
			State Water Permit may be required
	Manure Treatments	Cover #1	Narrative on manure handling techniques to minimize nutrient losses.
	Management of Dead Animals	Cover #1	Narrative on handling of dead animals; composting, rendering, or off-site removal to location removed from surface/ground water sources.
	Land Application of Manure		
	Nutrient Balance	Cover #4	See required components for a Nutrient Management Plan. The Nutrient Management Plan component of a CNMP MUST be reviewed and approved by a certified Nutrient Management Planner. In addition, the design criteria should include:
			Herd Size (ECS – 45A/B)
			Average Animal Size (ECS – 45A/B)
			Days of Confinement (ECS – 45A/B)
			Average Manure Moisture Content (ECS – 45A/B)
			Crop Receiving Manure (ECS – 45A/B)
			Yield of Crop Receiving Manure (ECS – 45A/B)
			Recommended Nutrients to Achieve Yield (ECS – 45A/B)
			Nitrogen – based Application Rate (ECS – 45A/B)
			Phosphorus – based Application Rate (ECS – 45A/B)
			Phosphorus Index Assessment (ECS – 45A/B)
			Land Base Calculation (ECS – 45A/B or Agronomy Tech Note #14)

COMPREHENSIVE NUTRIENT MANAGEMENT PLAN CHECKLIST (CONT'D)

✔	Component	Recommended Location in Case File	Documentation/Jobsheet
	Timing and Methods of Application	Cover #4	Narrative describing approximate timing of manure application. Additional narrative will detail methods of application including narrative on spreader calibration techniques.
	Land Management	Cover #1	Narrative or reference to Land Management portion of regular Conservation Plan.
	Record Keeping	Retained by producer	NRCS case files should NOT contain producer-specific records/history of manure application rates. However, it is incumbent upon NRCS to educate producers of the absolute importance of maintaining an adequate record keeping system.
	Other Utilization Options	Cover #1	Narrative, but more importantly, part of the producer's record keeping system.

The narratives on items such as Feed Management, Dead Animal Management, and Land Management can be incorporated into a 2-3 page summary of the entire CNMP. This summary could also include the Operation and Maintenance of any storage/retention structures, timing/rates/method or application. An example of such a summary is attached.

Case File Cover Number	CNMP Component
1	Narrative Summary of CNMP
2	Technical Assistance Notes
3	Conservation Plan Map, Soil Map and Legend
4	Nutrient Management Plan and Supporting Documentation
5	DEQ Permit Supporting Documentation and/or State Water Permits
6	Engineering Documentation and Designs

COMPREHENSIVE NUTRIENT MANAGEMENT PLAN FOR BOHICA FARMS

OVERVIEW

Bohica Farms is located approximately 5 miles southwest of Wamsutter, Wyoming. The feedlot will have a capacity of approximately 5000 beef cattle. Animals are typically brought into the feedlot at 600 pounds, and shipped at 1,000 pounds. The farm also includes 320 acres of irrigated cropland/hayland. The feeding operation will be expanded from the current level of 2000 head to 5000 head over the next several years. This expansion will be done in 3 phases beginning in 2001 and being completed about 2003.

Soils on the irrigated cropland and hayland consist primarily of fine sandy loams and sandy clay loams with slopes of 0-2 percent. The nearest surface water is Dinky Creek located to the northwest approximately ¾ of a mile. Elevation at the farmstead is 5000 ft. Depth to initial groundwater ranges from 70 to 100 feet.

Manure from the feeding operation is collected and stored in the pens. The manure is then spread and incorporated in the fields, usually in March. See the attached Manure Management/Nutrient Management section on the ECS-45A, Cover #5. Surface water is collected below each phase of pens in a short-term retention structure. These small berms/dikes will contain the runoff equivalent of a 25-year/24 hour storm (2.8 in.). The liquid from the retention structures is released into gated pipe and spread over fields as a supplemental irrigation. See the attached engineering design and supporting documentation on Cover #6.

Nutrient analysis has been conducted on the manure. In addition, soils tests are also collected and will be used to determine rates of manure application. The soil tests will be done annually and the manure analysis will be conducted every 1 – 3 years.

FEED MANAGEMENT

Animal diets will be formulated to meet the needs of the livestock class. Reduced inputs and greater utilization of phosphorus by the animal can reduce the amount of phosphorus excreted and produces manure with nitrogen: phosphorus ratio closer to that required by plants. Little information is currently available on the formulation of low-phosphorus feeds for non-mono gastric animals, but could be included in future modifications of this plan.

MANURE HANDLING AND STORAGE

Clean Water Diversion - Clean water is diverted around the feedlot through the use of a berm/dike and carried away with an earthen ditch. Clean water can also include rainfall falling on roofs. See the attached dike design on Cover #6 of this case file.

Wastewater Management - Runoff from the feedlot contained in the retention structures will be held for a short period of time. The time will vary depending upon the available water holding capacity of the soil profile where water is to be spread. Typically, 3-5 days of retention will be an adequate time until fields are able to accept a supplemental irrigation. A simple slide gate installed on the end of the structures will be opened and wastewater will be applied to cropland through gated pipe. The gated pipe will be split at regular intervals to maximize the area receiving the stored water.

Prevent Leakage – Construction and maintenance of buildings, collection systems, silage pits, and feedlots will minimize leakage of organic matter, nutrients, and pathogens to ground or surface water. The construction and management of the previously mentioned retention structures will prevent leakage to surface or ground water.

Adequate Storage – Adequate storage for the solid manure fraction is realized by in-feedlot storage. No stacking facility or temporary manure storage facility will be needed. Adequate storage for wastewater has been previously discussed. Scraping of the feedlot area usually occurs twice a year.

Manure Treatments – Maximum nutrient retention will be accomplished by soil-incorporation within 3 days of surface application of solid manure. No further manure treatment is needed.

Management of Dead Animals – All dead animals are removed from the lot and the local rendering facility is contacted for disposal.

LAND APPLICATION OF MANURE

Nutrient Balance

Manure application rates have been calculated based on current soil test values, current manure test values and current crop production data. Manure will normally be applied to the cropland being rotated to corn. Additionally, soil samples will be taken annually and conducted per attached guidelines. Application rates will be determined using soil sample data as per attached example (See attached WY-ECS-45). The Phosphorus Index indicates that under present soil test phosphorus levels and other current management practices, nitrogen-based application rates are acceptable.

Recommended manure application rates could be modified as a result of changes in soil test and or manure test values as well as changes to crop rotations and/or crop yields.

Timing and Methods of Application

Manure application will be timed to coincide with spring tillage. Disking within 3 days of application will incorporate manure. Manure will be distributed over fields with a manure spreader. This spreader will be calibrated to insure proper application of nutrients to cropland. Refer to attached Colorado State University Bulletins for information on spreader calibration. Manure will be sampled and analyzed every 1 – 3 years or whenever feed type changes

LAND MANAGEMENT

Conservation practices on all Highly Erodible Land are fully implemented. See the Conservation Plan for Bohica Farms in the HEL/Compliance file cabinet. Should land-use change, this plan can be modified to reflect those changes.

RECORD KEEPING

Documentation should be kept on soil tests, manure analysis, and precipitation events. Records will be managed and kept on manure application and timing. These records will include amounts of manure spread, area applied, rate of application, crop, dates, and incorporation method. In addition, records should be kept to reflect irrigation scheduling and retention structure releases of water.